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Leverage change, debt capacity, and stock prices

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Abstract

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Keywords: Leverage, Debt Capacity, Stock Prices, Pecking Order, Capital Structure
JEL Classification: G32

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Abstract

We document a significantly negative effect of the change in a firm's leverage ratio on its stock prices. This effect cannot be explained by popular asset pricing factors or firm characteristics. We find that the negative effect is stronger for firms with limited debt capacity. Moreover, firms with an increase in leverage ratio tend to have less future investment, even after controlling for growth option and target leverage. These findings are consistent with a dynamic view of the pecking-order theory that an increase in leverage reduces firms' safe debt capacity and may lead to future underinvestment, thus reducing firm value. This effect of debt capacity is not subsumed by the default risk, since the return pattern also exists among financially healthy firms and portfolios sorted by change in leverage ratio show no obvious pattern in future expected returns after the immediate price change. Additional tests show that the price effect cannot be fully explained by the tradeoff or the market timing theories.

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1. Introduction

Since Modigliani and Miller (1958), many authors have examined firms' capital structure choices and its relation with other firm characteristics.[1] In this paper, we examine how the stock price of a firm reacts to the overall change of its capital structure. The choice of capital structure is arguably one of the most important decisions managers face, and a change in the leverage ratio can affect a firm's financing capacity, risk, cost of capital, investment and strategic decisions, and ultimately shareholder wealth. So far, few have studied the market reaction to the changes of capital structure in a general setting, except several event studies of debt and stock issuance and share repurchase.[2] Leverage ratio can be affected by many other factors in addition to security issuance and share repurchase, such as earnings accumulation, use or provision of trade credit, payment or use of existing credit lines, and dividend payment, etc. Thus, we examine the overall effect of the change in leverage ratio on the stock price.

As we discuss in details later, examining the relation between the change in capital structure and stock prices also provides a new venue for testing the predictions of various capital structure theories. The empirical relation between the change in leverage ratio and stock prices can also help us better understand related issues such as the default risk and the relation between firms' capital structure choice and future investment. Finally, it may also help investors better understand the stock price dynamics and may have implications on investors' portfolio allocation decisions.

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[1] See Harris and Raviv (1991), Frank and Goyal (2005b) and Parson and Titman (2007) for literature surveys.
[2] See, for example, Loughran and Ritter (1995) and Jung, Kim, and Stulz (1996), among others.

In this study, we sort all U.S. stocks in CRSP-Compustat universe (subject to data availability criteria) into deciles by their most recent quarterly change in leverage ratio for each month from 1975 to 2002.[3,4] We find a significantly negative effect of the change in leverage ratio on the portfolio returns. The value-weighted return difference between the top and bottom decile portfolios is 0.55% a month, or over 6.8% annually. The differences for equal-weighted portfolio returns are even higher. The return differences cannot be explained by the Fama-French factors or the Carhart (1997) momentum factor, and the negative effect is robust after controlling for a number of firm characteristics.

We next examine a number of theories that might explain the negative effect of leverage change on stock prices. Although this negative effect can be consistent with both the tradeoff theory and the default risk premium, the collective evidence from further tests, however, provides more support to a dynamic version of the pecking-order theory.[5] In the static pecking-order theory, firms' financing preference is in the order of retained earning, riskless debt, risky debt, and external equity. Hence, an increase in a firm's leverage ratio is not necessarily bad news. However, Lemmon and Zender (2004) emphasize the importance of debt capacity in testing the peck-order theory. This echoes the dynamic version of the pecking-order model (Myers (1984)) that an increase in leverage lowers a firm's safe debt capacity and lead to future underinvestment (Lang, Ofek, and Stultz (1996), Aivazian, Ge, and Qiu (2005), and Ahn, Denis,

[3] We perform this sorting monthly because firms have their fiscal quarter end in different months.

[4] We measure the stock market reaction to leverage change with the next-quarter returns because the overall leverage change cannot be calculated until the end of a quarter and the information of this change usually arrives at the market in the following quarter. This may be a noisy measure of the market reaction since some corporate events that also affect leverage may be announced before the end of a fiscal quarter and the market reaction is captured in the stock returns of the same quarter. This noise in the data however would work against us and make our results conservative. In a robustness test, we examine the stock returns during the same quarter of the leverage change and our main results are similar.

[5] For pecking order theories and empirical evidence, see Myers (1984), Myers and Majluf (1984), Narayanan (1988) and Heinkel and Zechner (1990), Shyam-Sunder and Myers (1999), Fama and French (2002), Frank and Goyal (2003), Mayer and Sussman (2004), and Leary and Roberts (2005b), among others. Frank and Goyal (2005b) provides a comprehensive survey of the literature.

and Denis (2006)). If the change in leverage ratio proxies for the change in a firm's debt capacity, then an increase in leverage will result in a lower stock price, holding others factors equal. Our empirical findings are consistent with this argument.

Further, we find direct evidence that an increase in leverage ratio leads to lower real investment (or fewer investment opportunities) in the future. Specifically, one standard deviation increase in leverage ratio leads to an average decrease of 7.0% in Q (the market value of assets to the book value of assets), 4.2% in investment rate, and 0.51% in R&D, for the next four quarters. This evidence is consistent with Matsa (2007) who finds that supermarkets reduce profitable investment after leverage buyouts. Our findings also complement Mura and Marchica (2007) who find firms with low leverage tend to make major investment in the future.

The above evidence can also be consistent with the tradeoff theory, which predicts a negative relation between investment opportunities and leverage. A negative shock to investment opportunities decreases the opportunity cost of financial distress, thus increasing the optimal leverage of a firm; hence the firm increases its leverage accordingly. The stock price drops as the market learns about the reduced investment opportunity. Similarly, Barclay, Smith, and Morellec (2006) argue that the debt capacity of growth option is negative. Thus, a firm may optimally increase its leverage level after exercising its growth option while fewer growth options may lead to lower investment in the future. To control for the endogenous change of observed leverage due to changes in the target leverage and investment opportunity, we estimate a regression of leverage change on the change of target leverage as well as the book-to-market ratio (proxy for growth option) and its changes. We then use the residual leverage change in the investment regressions. We find that the residual change in leverage ratio (orthogonal to changes in target leverage and growth option) does lead to significantly lower future investment. This finding is consistent with the prediction of the dynamic view of the pecking-order theory.

The debt capacity of a firm can also be related to its expected future performance and investment opportunities, among other firm conditions. Although these firm conditions may impact in various ways the choice of leverage and hence debt capacity, the dynamic pecking-order theory, however, implies that holding everything else constant, an increase in leverage ratio decreases the debt capacity at the margin and results in a negative price effect. To the extent that in the cross-section of firms earnings and growth opportunity in the next period are positively correlated with those of this period, we control these variables in the Fama-Macbeth (1973) regression in Table 4 and our main findings are robust.

When a firm has ample debt capacity, an increase in leverage ratio may not materially affect future investment and expected future cash flow. Thus, we expect the negative effect of leverage change to be relatively weaker for firms with higher debt capacity, and stronger for those with limited capacity. Since empirically there's no consensus on the precise measure of debt capacity, we examine a number of proxies for debt capacity to test this implication, including the lagged leverage level, total assets, measures of financial distress (Ohlson's (1980) financial distress measure *O*-score and Vassalou and Xing (2004) default likelihood measure), and Whited and Wu's (2006) financial constraints Index (hereafter FC index).[6] We conduct a two-way sorting first by the debt capacity measures and then by the change in leverage ratio. We find that the negative effect of leverage change on stock prices is stronger for firms with lower debt capacity measures than for those with higher debt capacity. The results hold for all five debt

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[6] Although the latter three proxies are designed to measure the distress risk and financial constraints, respectively, to the extent that firms with higher distress risk or more financial constraints have lower debt capacity, the dynamic pecking order theory predicts firms with higher *distress or financial constraint measures* to be more sensitive to leverage change.

capacity measures and for both equal- and value-weighted portfolio returns. To further distinguish these debt capacity measures from the effect of optimal leverage suggested the tradeoff theory, we estimate regressions of these debt capacity measures on target leverage, and use the residuals to measure debt capacity. We find similar results.

The negative relation between the leverage change and the stock price may also be consistent with a default premium theory. When a firm has used most of its safe debt capacity, a further increase in the leverage ratio may lead to an increase in the firm's likelihood and the expected cost of default. If the default risk is priced, the firm faces a higher discount rate, and hence an immediate stock price drop.[7] Thus, while the dynamic pecking order story explains the negative effect of the leverage change mainly through the change in the future cash flow (the price effect), the default risk story explains the negative effect by the change in the future expected return (the discount rate effect). To test this implication on expected returns, we examine the portfolio returns during the one–year period after the immediate price change. We find no apparent pattern of the one-year expected returns across portfolios sorted by change in leverage ratio. Further, we find that the negative relation between leverage change and stock price remains significant for financially healthy firms. These evidences suggest that the default risk cannot fully explain the negative effect of the change in leverage ratio on stock prices. The immediate price drop after leverage ratio increases is more likely driven by a change in expected future cash flows than a change in the discount rate. [8]

The above tests have shown that the debt capacity has direct impact on how stock market reacts to leverage change, even after controlling for the effects of change in target leverage

[7] Recent studies find mixed evidence on the relation between default risk and stock returns. Please refer to section 4.2 for more detailed discussion and references on the empirical evidence of the default risk.
[8] Gomes and Schmid (2006) present a model where exercising growth option increases asset-in-place and lower the risk level, which leads to lower expected returns. Our evidence on expected returns suggest that our main results are unlikely driven by shift in risk due to change in growth option.

implied by the tradeoff theory. To further examine whether the tradeoff theory can explain our findings, we note that the tradeoff theory suggests the presence of an optimal (target) leverage level, and any deviation (either from above or below) from that level has a negative effect on the stock price.[9] To the extent that the past level of leverage ratio is at the optimal, our finding is inconsistent with the tradeoff theory. Further, we estimate the optimal (or partially optimal) leverage ratio and calculate the deviation from the optimal level. We sort the sample stocks into ten portfolios by the deviation from the optimal leverage ratio and find no evidence that returns across these ten portfolios display any apparent pattern. To account for possible slow adjustment to the target leverage, we also sort sample stocks into ten portfolios by the change in the deviation and again find no apparent return patterns across the portfolios.

Our empirical evidence is also unlikely to be explained by the market timing hypothesis. Eckbo, Masulis, and Norli (2007) review the literature of exchanges offers and show that in general, leverage decreasing activities (e.g., SEO) lead to lower stock returns, likely due to asymmetric information, while leverage increasing activities (e.g., debt issuance) lead to higher stock returns. Similarly, the market timing hypothesis predicts that a firm issues new equity (repurchases stock) when its equity is overvalued (undervalued).[10] Thus, the leverage change due to a firm's market timing action is positively related to stock returns, opposite to our results. In this paper we examine the aggregate effect of the change in debt capacity on stock price using a large sample of firms over a long period of time, while studies of security issuance and market timing often focus on a short time period surrounding these specific corporate events. The

[9] For the tradeoff theories and empirical evidence, see Deangelo and Masulis (1980), Harris and Raviv (1990), Titman and Wessels (1988), Stulz (1990), Opler and Titman (1993, 1994), Berens and Cuny (1995), Rajan and Zingles (1995), Jung, Kim, and Stulz (1996), Lang, Ofek, and Stulz (1996), and Hovakimian, Opler and Titman (2001), Hennessy and Whited (2005), Hackbarth, Hennessy, Leland (2007), among others. Frank and Goyal (2005b) provides a comprehensive survey of the literature.

[10] For market-timing theries and empirical evidence, see Stein (1996), Baker and Wurgler (2002), Alti (2004), Hovakimian (2004, 2006), Welch (2004), and Huang and Ritter (2005), among others.

majority of the firm/quarter observations in our sample do not have such events. Our evidence hence highlights the role of debt capacity in explaining the market reaction to overall change on leverage ratio, beyond the price effects of security issuance and market timing.

In summary, we find a robust and significantly negative relation between leverage change and stock market reaction. To our best knowledge, this paper is the first study to document the negative effect of quarterly leverage change on stock prices. Our collective evidence highlights the importance of debt capacity, consistent with a dynamic view of the peck-order theory.

The rest of the paper is organized as follows. Section 2 discusses the data. Section 3 presents the main results. Section 4 tests the potential explanations of our main results. Section 5 concludes.

2. Data

Our data are quite standard. Monthly stock returns and market capitalization data are from CRSP (Center for Research in Security Prices). Total liability, book value of equity, ROE, and other firm characteristics are from Compustat quarterly industry file. We require that a firm has relevant data available on both the CRSP and Compustat to be included in the sample, which spans from 1975 to 2002. Following the literature convention, we exclude all financial and utility firms (Banking, Insurance, Real Estate, Trading, and Utilities industries as defined by Fama and French (1997)). We also exclude firms with non-positive book values of equity and negative total liabilities.

The literature measures capital structure in two ways: book leverage, which equals the book value of total liabilities divided by the book value of total assets; and market leverage, which equals the book value of total liability divided by the sum of the book value of total liabilities and the market value of shareholders' equity. Market leverage is not suitable for our study, since its change is mechanically correlated with stock price. Therefore, we use book leverage to measure capital structure. Compared to the market value, the book value of assets is also more stable.

Table 1 reports the summary statistics of the level and change in leverage ratio of the firms in our sample. The average firm has a leverage ratio of 0.47. We define leverage change as the change in book leverage from the previous quarter. We note that although the average leverage change per quarter is small, the cross-sectional standard deviation is substantial. This is because that the leverage change can be either positive or negative. A positive 10% change and a minus 10% change result in zero mean, yet the standard deviation is 6.7%. The size and book-to-market of firms in our sample are also comparable to other studies.

Insert Table 1 about here

3. Main results

In this section we provide evidence on how the change in a firm's leverage ratio affects its stock price. We sort the firms into ten portfolios, with portfolio one having the lowest change (most negative) in leverage ratio and portfolio ten having the highest change (most positive). Since different firms end their fiscal quarters in different months, we perform the sorting monthly, and the resulting portfolios have different component stocks in every month. We next calculate the equal-weighted and value-weighted monthly returns for each portfolio during both the current quarter and the next quarter after the leverage change.

Table 2 reports the leverage change and the average monthly returns for each of the ten portfolios. The first two columns report results for the current quarter. Average monthly portfolio return deceases as the change of leverage increases. The difference between portfolio one (highest leverage decrease) and portfolio ten (highest leverage increase) is 2.16% for equal-weighted returns and 0.66% for value-weighted returns, and both are statistically significant at the 1% level. Since the change in leverage may occur at any time of a given quarter and its reporting is often in the next quarter, the current-quarter returns may be before the information about the change in leverage reaches the market, and hence may not be the appropriate measure of market reaction to the change in leverage. Thus, we next examine the relation between change of leverage and next-quarter stock returns. The next two columns of Table 2 report the results. We find again that the average portfolio returns decrease as the change in leverage increases. For equal-weighted portfolios, the average monthly return equals 2.02% for portfolio one (highest leverage decrease) and 1.03% for portfolio ten (highest leverage increase). The return difference between the two portfolios is 0.99%, statistically significant at the 1% level. The value-weighted portfolios exhibit a similar pattern. The monthly return difference between portfolio one and portfolio ten is 0.55%, also significant at the 1% level. In subsequent analysis, we focus on the relation between change in leverage and the average monthly returns in the next quarter. We view the monthly returns in the next quarter as the market's timely reaction to the leverage change. Most of our results hold with returns during the current quarter of leverage change as well. The last two columns report the leverage changes of each of the ten deciles. As expected, the first decile has the most negative leverage change while the tenth decile has the most positive change. Although deciles one and ten have the largest leverage changes, deciles two and nine also have substantial changes. More importantly, the return pattern we document in the first four columns of Table 2 is present outside the top and bottom leverage change deciles. Our results do not appear to be driven by extreme leverage changes.

Insert Table 2 about here

It is possible that the observed negative relation between the leverage ratio change and the stork returns reflects the cross-sectional differential loadings on systematic risk factors. We next examine whether the above documented patterns can be explained by popular asset pricing models. We consider three models: The Capital Asset Pricing Model (CAPM), the Fama-French (1993) three-factor model, and the Carhart (1997) four-factor (three-factor plus the momentum factor). For each portfolio constructed in Table 2, we run the following time-series regression:

$$r_{it} - r_{ft} = \alpha_i + \beta_i' F_t + \varepsilon_{it} \quad \text{(for i=1 to 10)}, \tag{1}$$

where r_{it} are the monthly portfolio returns, and r_{ft} is the risk-free rate measured by the one-month T-bill rate. F_t is a vector of factor returns including the market excess return, returns of the Fama-French size factor (SMB), book-to-market factor (HML), and the momentum factor (UMD). We obtain the return series of these factors and the one-month T-bill rate from Kenneth French's website.[11] The alphas from the regressions are the risk-adjusted returns for the portfolios. If these factors can explain the cross-sectional return patterns of the ten portfolios sorted by leverage changes, we expect that the alphas to be similar across these portfolios.

Table 3 reports the regression alphas, as well as the multivariate *t*-test results. Panel A reports the results for equal-weighted portfolios and Panel B reports those results for the value-weighted portfolios. The basic message is that these asset pricing factors cannot fully explain the negative effect of leverage change on stock returns. For both the equal- and the value-weighted portfolios, we again observe a decreasing trend in portfolio alphas as the change in leverage ratio increases. For the equal-weighted portfolio in the CAPM model, the alpha equals 0.7% for portfolio one and -0.31% for portfolio ten. The alpha difference between portfolio one and ten is 1.02% per month, statistically significant at the 1% level. The magnitude of the alpha difference

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[11] We thank Ken French for making these data publicly available. For details on the construction of these factor returns, we refer readers to French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/.

is also similar to the raw return difference, suggesting that the negative effect of leverage change on stock returns cannot be explained by the market factor. Adding more factors does not alter the results. For both the Fama-French three-factor model and the four-factor model, we still find the decreasing trend in returns as leverage change increases, and the difference in alphas between portfolio one and portfolio ten equals 0.96% in the three-factor model and 0.63% in the four-factor model, and both are statistically significant at the 1% level. Finally, the Gibbens-Ross-Shanken (1989) test of the hypothesis that all ten alphas are equal is also strongly rejected in all three models.

Insert Table 3 about here

The results for the value-weighted portfolios are similar. For the CAPM and the three- and four-factor models, the alpha differences between the top and bottom portfolios equal 0.49%, 0.5%, and 0.45% per month respectively, and all are statistically significant at the 5% level. Their magnitude is also similar to the raw return difference of 0.55%. In all three models, we again reject the null hypothesis that all ten alphas are equal at the 5% level.

Although the factor models cannot explain the negative relation between the change in leverage ratio and next quarter stock returns, a firm's capital structure choice may depend on other firm characteristics not captured by these risk factors. Furthermore, Daniel and Titman (1997) argue that characteristic-based models can better explain the cross-section of stock returns. It is possible that the explanatory power of leverage change on stock returns can be explained by other firm characteristics. To examine the marginal effect of leverage change on cross-sectional stock returns, we run Fama and Macbeth (1973) type cross-sectional regressions of monthly individual stock returns on the change in leverage ratio of the most recent fiscal quarter, among other control variables.

$$r_{it+1} = \alpha_t + \beta_{\Delta LV,t} \Delta LV_t + \beta'_{control,t} control\, vector\ , \qquad (2)$$

where ΔLV_t is the leverage change during the most recent fiscal quarter.

The control variables include the stock beta estimated as in Fama and French (1992) with past 36 months return data, the log of market value of equity at the end of last month, the book-to-market ratio and ROE at the end of the previous quarter, the past one-month and past one-year stock returns, and the leverage level at the beginning of the previous quarter. Rampini and Viswanathan (2008) argue that the opportunity cost of conserving debt capacity is higher for the more productive firms, thus we control for prior ROE and stock returns. The capital structure literature identifies a long list of variables that might affect a firm's choice of the leverage ratio. Since the determinants of the capital structure are not the focus of this paper, we do not include all these variables in our regressions. Instead, we include the level of leverage ratio at the beginning of the previous quarter (LV_{t-1}) to summarize the cumulative effects those variables may have on firms' leverage. [12] Including the leverage level in the regression also controls for the time-invariant effect of leverage documented by Lemmon, Roberts, and Zender (2008).

Insert Table 4 about here

Table 4 reports the time series averages of the estimated regression coefficients and the corresponding *t*-statistics. In regression (1) we include only the change in leverage ratio during the previous quarter; in regression (2) we also include the level of leverage ratio at the beginning

[12] For determinants of capital structure, see Titman and Wessels (1988) and Frank and Goyal (2005a), Antoniou, Guney, and Paudyal (2007), and Douglas (2006), Kayhan and Titman (2007), Hovakimian, Hovakimian, and Tehranian (2004), among others. MacKay and Phillips (2005) find that industry is an important determinant of firms' leverage. Since we controlled for the leverage of each firm, we do not control for industry in regression (3).

of the previous quarter; in regression (3) we add all other control variables; and in regression (4) we include the change of the firm characteristics as control variables. For all four regressions, the average coefficient for the change in the leverage ratio is negative and statistically significant at the 1% level. Including the control variables slightly lowers the average coefficient of the change in the leverage ratio in regression (3), but the average coefficient for the leverage change remains significant. The results are also economically significant. A one standard deviation increase in the leverage ratio leads to a 23 basis points decrease in average monthly stock return after controlling for various firm characteristics. Among the control variables, LV_{t-1} is not significantly related to stock returns. Intuitively, the information contained in the level of leverage ratio should already be incorporated into the stock price in an efficient market, and the market only reacts to the innovation in the leverage ratio.[13] The average coefficient estimates for other control variables are largely consistent with the existing literature. The CAPM beta has no explanatory power, consistent with the findings of Fama and French (1992). The average coefficient of firm size is significant and negative, consistent with the size effect. Both the book-to-market and ROE coefficients are positive and highly significant. Consistent with the return momentum literature, the average coefficient for the one-year-return is positive and statistically significant at the 1% level. Consistent with the short-term return reversal, the average coefficient for the past one-month return is significantly negative. Overall, the cross-sectional regression results suggest that the effect of capital structure innovation on the stock price is not proxy for the effects of earnings or other firm characteristics[14].

[13] The literature finds mixed relation between leverage and future stock returns. Bhandari (1988) and Sivaprasad and Muradoglu (2007) find that returns increase in leverage, while Korteweg (2004), Penman, Richardson, and Tuna (2007), and George and Hwang (2007) find that returns decrease in leverage. Our results suggest that the effect of the leverage level (if any) is subsumed by the effect of change in leverage ratio.

[14] As a robustness test, we exclude all firm/quarter observations with negative ROE, and we find very similar results.

4. Hypotheses testing and interpretations

Why is there a negative effect of the change in leverage ratio on stock prices? In this section, we investigate a number of capital structure theories that might explain the observed return pattern.

4.1. Dynamic pecking-order theory and the effect of debt capacity

In the static pecking-order model, debt financing is preferred to equity financing; hence an increase in leverage ratio is not necessarily bad news. However, Myers (1984) points out that when a firm makes dynamic investment decisions, increasing leverage ratio reduces a firm's safe debt capacity and hence increases the possibility of forgoing positive NPV projects in the future, which can have a negative effect on stock prices. Empirically, Lemmon and Zender (2004) find that concerns over debt capacity can explain why firms use external equity financing over debt financing. They also show that firms often stockpile debt capacity. Lang, Ofek, and Stultz (1996), Aivazian, Ge, and Qiu (2005), and Ahn, Denis, and Denis (2006) directly examine the relation between leverage and future investment as well as growth and find that leverage has a negative effect on future investment and growth. Our results appear to be consistent with this stream of the literature.

The manager of a firm, nevertheless, may consider the anticipated performance and investment opportunities of her company when making decisions related to debt capacity. These factors may have various impacts on the choice of leverage ratio, and result in different market reactions. However, holding everything else constant, an increase in leverage ratio decreases the debt capacity at the margin. To the extent that in the cross-section of firms the anticipated earnings and investment opportunity of the next period are correlated to those of the current period, we control for these variables (ROE, book-to-market, and their changes) in the cross-sectional regressions in Table 4 and the coefficients for leverage change remain significantly negative.

To further test the dynamic version of the pecking-order theory, we explicitly examine how the change in leverage ratio affects the change in future investment. Similar to Fama and French (2002), we measure the future investment by the average values of the Q ratio, the investment rate, and the R&D and capital expenditures over the next four quarters. Q equals the market value of total assets divided by the book value of total assets, where the market value of total assets equals the market value of equity and the book value of total liabilities. The investment rate equals the percent change in total assets from the last quarter. The R&D and capital expenditure equals the sum of the R&D and capital expenditure expenses divided by the total assets of the last quarter. We next estimate regressions of the measures of future change in investment on the current-quarter leverage change, along with the book-to-market ratio, the log of market value of equity, and ROE. Regression (1), (3), and (5) of Table 5 show that the coefficients for the change in leverage ratio are negative and statistically significant at the 1% level in all three regressions. The coefficients are also economically meaningful. A one standard deviation increase in the leverage ratio on average lowers future Q ratio by 7.0%, future investment rate by 4.2%, and future R&D and Capital Expenditure by 0.51%, for the next four quarters. These results suggest that a current increase in leverage ratio tends to lower future investment, consistent with the dynamic pecking-order theory.

Insert Table 5 about here

Barclay, Smith, and Morellec (2006) argue that the debt capacity of growth option is negative. Thus, a firm may optimally choose to increase target leverage level after exercising its growth option. Since exercising growth option often requires major investments, the firm may also make fewer investments after its growth option is exercised. Therefore, the negative relation between leverage increase and future investment may be driven by change in a firm's growth option. Similarly, Lyandres and Zhdanov (2008) argue that higher leverage leads to earlier exercise of growth options and accelerated investment. Further, trade-off theory predicts a negative relation between investment opportunity and optimal leverage. A firm may optimally increase its leverage when facing a negative shock to its investment opportunity. This negative shock also results in lower future investment. To control for growth options and change in optimal leverage, we run the following two-step regressions. In the first step, we estimate a regression of the change in leverage on the same-quarter change in book-to-market ratio (proxy for growth option), the previous-quarter's book-to-market ratio, and the change of target leverage.[15] In the second step, we estimate the investment regressions with the residual change of leverage from the first step as the main explanatory variable, which is orthogonal to changes in growth option and target leverage. The results are reported in Regressions (2), (4), and (6) of Table 5. The results are essentially unchanged with the residual change in leverage replacing the raw change in leverage for all three measures of future investment. Hence the negative relation between change in leverage and future investment is robust after controlling the changes in growth option as well as target leverage.

The dynamic pecking-order model also suggests that the negative effect of the change in leverage ratio on stock prices is stronger for firms that already have lower debt capacity. To test this prediction, we use several proxies for firms' debt capacity and conduct two-way sorts by debt capacity and the change in leverage ratio. We first consider two proxies for a firm's debt capacity, the (inverse of) leverage level, and the total asset. Holding everything else equal, firms

[15] The estimation procedure of target leverage is described in Section 4.3 where we test the tradeoff theory.

with higher leverage and smaller asset base, are likely to have lower debt capacity. We further examine the effect of debt capacity by using three additional proxies: Ohlson's (1980) *O*-score, Vassalou and Xing (2004) default likelihood measure (*VX* measure thereafter), and Whited and Wu's (2006) FC index.[16] Although these proxies are designed to measure the distress risk and financial constraints, to the extent that firms with higher distress risk or more financial constraints have limited debt capacity, the dynamic pecking order theory predicts firms with higher *O*-score, *VX* measure, or FC index to be more sensitive to leverage change.[17]

In the two-way sort, we first sort our sample of stocks into five portfolios by one of the five debt capacity measures at the beginning of the most recent fiscal quarter Then, within each of the five debt-capacity-sorted portfolios, we sort the firms into five sub-portfolios by the change in leverage ratio during the most recent fiscal quarter. Panel A of Table 6 reports the average returns for the portfolio matrix sorted by the leverage level and the change in leverage ratio. The results again support the dynamic packing order theory. We find that the negative effect of leverage change on stock returns is stronger for stocks that already have a relatively high leverage level. For the equal-weighted portfolios, in the lowest leverage quintile, the return difference between the top and bottom leverage-change portfolios is only 0.19%, with an

[16] *O*-score is defined as Oscore = -1.32 – 0.40 7log(total assets) + 6.03 (working capital / total assets) + 0.076(current liability / current assets) – 1.72 (1 if total liability > total assets, 0 otherwise) – 2.73 (net income/ total assets) – 1.83 (funds from operation / total liability) + 0.285 (1 if a net loss for the last two years, 0 otherwise) – 0.521 [(net income$_t$ – net income$_{t-1}$)/(|net income$_t$| + |net income$_{t-1}$|)]. Since Ohlson (1980) estimate the *O*-score with annual data, in our estimation based on quarterly data, we multiply funds from operation by four. Further we use the net income during the last eight quarters for the last two years' net income.
FC index is defined as FC index = -0.091 cash flow – 0.062 (1 if positive dividends are paid, 0 otherwise) + 0.021 (total long term debt / total assets) – 0.044log(total assets) + 0.102 (industry sales growth) – 0.035(sales growth). Whited and Wu (2006) estimate the FC index with quarterly data. *VX* measure is downloaded from Maria Vassalou's website. (http://www.maria-vassalou.com/data.html) We thank her for making the data publicly available.

[17]These three measures also help to alleviate the endogeneity issue of leverage ratio, i.e., firms may choose to have lower leverage ratio if the cost of having high leverage ratio is high. For example, Titman and Wessels (1988), and George and Hwang (2007) show that firms with high financial distress costs tend to have lower debt ratio. Whited and Wu (2006) show that financially constrained firms tend to have slightly lower debt ratio. Similarly, it's possible that a firm with limited debt capacity choose to have low debt ratio.

insignificant *t*-statistic of 0.1. As the level of leverage ratio increases, the negative effect of leverage change becomes stronger. From the leverage level quintile 2 to quintile 5 (the highest), return difference equals 0.57%, 0.94%, 1.37%, and 1.68%, respectively, all statistically significant at the 1% level. The results of the value-weighted portfolios are similar with smaller magnitude. The monthly return difference between the top and bottom leverage-change sorted portfolios is -0.23% for the lowest leverage level quintile, and 0.74% for the highest quintile.

Insert Table 6 about here

Panel B reports the average monthly returns of the portfolio matrix sorted by total book assets and the change in leverage ratio. Consistent with the dynamic pecking-order model, we find that for firms with the lowest assets, the return difference between the lowest and highest leverage-change-sorted portfolios equals 0.94% for the equal-weight portfolio and 0.70% for the value-weighted portfolios. In contrast, the corresponding return differences equal 0.66% and 0.39% for the largest firms.

Panel C reports the average monthly returns for the portfolio matrix sorted by *O*-score and leverage change. For the lowest *O*-score quintile (the least constrained firms), both the equal- and value- weighted return difference between the top and bottom leverage-change sorted portfolios are insignificantly different from zero. Moving up to the *O*-score quintiles 2 to 5(highest *O*-score quintile), the return differences across the leverage change portfolios become larger and statistically significant. For the highest *O*-score quintile (the most constrained firms), the equal- and value- weighted monthly return differences between the top and bottom leverage change portfolios equal 1.75% and 1.37%, respectively. Both figures are highly significant at the 1% level.

Panel D shows that the results for *VX* measure sorted portfolios are also consistent with the prediction of the dynamic pecking-order theory. For the quintile with the lowest *VX* measure, both equal- and value-weighted return differences between the top and bottom leverage-change sorted portfolios are statistically insignificant. The corresponding return differences for the highest *VX* measure quintile are 2.47% for equal- weighted portfolios and 2.15% for value-weighted, both statistically significant at the 1% level.

We find similar patterns for portfolios sorted based on the FC index and leverage change. Panel E shows that from the lowest FC quintile (the least constrained firms) to the highest FC quintile (the most constrained firms), the equal-weighted return difference between the top and bottom leverage change quintiles increase from 0.50% to 1.22%. For value-weighted portfolios, the return difference between the top and bottom leverage-change sorted portfolios for FC quintile 1 equals 0.21%, insignificant at the 10% level. The corresponding return differences for FC quintiles 2 to 4 are much higher and statistically significant. However, for the highest FC quintile, the average return difference between the top and bottom leverage-sorted portfolios equals an insignificant 0.39%. This is because the highest leverage increase portfolio has an unusually high return. The return difference between the portfolio with the second highest increase in leverage and the one with the highest decrease in leverage is 1.16%, and statistically significant at the 5% level. Overall, our evidence in Table 6 is consistent with the dynamic packing order theory that debt capacity is more valuable for firms with low debt capacity.[18]

[18] We also use bond rating as a proxy for debt capacity. For all stocks that have bond rating, we group them into investment grade and non-investment grade, and then further sort stocks into 5 portfolios within each group. The results are qualitatively consistent with those reported using other proxies, i.e., firms in non-investment grade group have higher price sensitivity to the leverage change. However the proportion of firms that has bond ratings only account for about 13% of the entire sample. Further, Faulkender and Petersen (2006) find that firms with and without credit ratings have very different leverage ratio and argue that these firms belong to different distributions. We therefore don't include the credit ratings results in Table 6. The results are available from the authors upon request.

The five measures of debt capacity may be correlated with target leverage. To control this effect, we estimate regressions of these debt capacity measures on target leverage, and use the residuals in the two-way sort of Table 6. We find similar results (untabulated). Although it is difficult to precisely measure debt capacity empirically, the collective evidence from the five debt capacity proxies is consistent with the prediction of the debt capacity in the dynamic pecking order theory.

4.2. Default risk theory

As discussed in the introduction, when a firm already has limited debt capacity, a further increase in leverage ratio can materially increase the likelihood and the expected cost of default. If the default risk is priced, a significant increase in the leverage leads to a higher expected return and hence immediate price drop.[19] Recent literature has found mixed evidence on the relation between default risk and stock returns. Vassalou and Xing (2004) document high next-month returns for stocks with high default likelihood. Da and Gao (2006) however argue that Vassalou and Xing (2004) finding is mainly driven by a clientele change immediately after the increase in the default likelihood. Bharath and Shumway (2007) argue that the KMV-Merton model that underlines the Vassalou and Xing's estimation does not provide a sufficient statistics for default probability. Dichev (1998) and Campbell, Hilcher and Szilagyi (2006) find a negative relation between distress risk and future stock returns. Garlappi, Shu and Yan (2006) argue that the bargaining between shareholders and debt holders can lead to non-monotonic relations between the likelihood of default and the stock returns. George and Hwang (2007) show that the Vassalou

[19] Besides direct costs to debt holders, financial distress can be costly to customers and workers, and can spike actions from competitors. This reduces the competitiveness of the firm in its product market and may reduce firm value. See Parsons and Titman (2007) for a survey on related issues and references therein.

and Xing (2004) results disappears after January is excluded, and argue that the default discount puzzle can be explained by the negative effect of the level of leverage ratio.

We do not intend to take a stand on this issue. Rather, we are interested in examining whether any potential effect of the default risk can account for our findings. As we discuss in the introduction, one of the main differences between the debt capacity effect and the default risk effect is that debt capacity explains our finding through the change in the expected future cash flows, while the default risk explains it by the change in the discount rate. Hence if the negative effect of leverage change is mainly driven by the change in default risk, we expect to observe different future expected return patterns across portfolios sorted by leverage change. We first examine the average future returns of the leverage-change-sorted portfolios during the one-year period starting one quarter after the leverage change. Notice that the stock returns here do not overlap with the stock returns in Tables 2 to 6. Panel A of Table 7 shows that for both equal- and value-weighted portfolios the return differences between portfolio one and portfolio ten are insignificant, either economically or statistically.

Insert Table 7 about here

To control for any possible effect of the level of leverage ratio on expected returns, we perform a two-dimension sort of the sample similar as above, first by the level of leverage ratio at the beginning of previous quarter, and then by the change in leverage ratio. Panel B of Table 7 shows that even among firms with higher leverage levels, the firms with the highest leverage increase do not exhibit higher next-year returns than the firms with the highest leverage decrease.

Next, recall that in Table 6 the negative relation between the leverage change and stock returns remains significant for financially healthy firms. In Table 6 we sort stocks into five-by-five portfolios based on the *O*-score and VX measures, proxies for financial distress risk, and the

FC financial constraint index. When sorted by the *O*-score, for firms in the intermediated three quintiles where default is unlikely, the monthly value-weighted return differences between the lowest and highest leverage-change sorted portfolios equal 0.41%, 0.78%, and 0.93%, respectively, and are statistically significant at the 10%, 1%, and 5% level. The corresponding figures equal 0.42%, 0.62%, and 0.68%, for the three intermediate quintiles sorted by the FC index, and all three figures are statistically significant at the 5% level. For *VX* measure sorted portfolios, the value-weighted return difference equals 0.92% and 1.00% for quintiles 2 and 4, although the return difference for quintile 3 is statistically insignificant. These results suggest that the negative effect of leverage change on stock price also exists for financially healthy firms and thus the financial constraint risk is unlikely to fully explain this effect either. The corresponding results for portfolios sorted by asset base or past leverage level are qualitatively similar and the results of the equal-weighted portfolios are similar with larger magnitude. The combined evidence of Tables 6 to 8 shows that the negative effect of leverage change on stock returns cannot be fully explained by default risk.

Gomes and Schmid (2006) present a model where exercising growth option increases asset-in-place and lowers the risk level, and thus lower expected returns. Since we do not find any significant return pattern in the one year period after the initial price drop, our findings seem unrelated to the change in growth option of firms.

4.3 Tradeoff Theory

An important implication of the tradeoff models is that there is an optimal (or target) leverage ratio. Any deviation (increase or decrease) from that optimal level is bad news and has a negative impact on stock price. Our initial results do not appear to support this argument. If the change in leverage ratio reflects a deviation from the target leverage level, the tradeoff models predict that stock returns are lower for portfolios at both ends. Therefore, the pattern of the portfolio returns should be an inverse U-shape. In contrast, our earlier results show that the relation between the change in leverage ratio and the stock return is monotonic. This finding is inconsistent with the prediction of the tradeoff models.

An implicit assumption in the argument above is that a firm's previous quarter leverage ratio is at its optimal level, which may not be true. To address this issue, we estimate a firm's deviation from its optimal leverage with the following two steps. First, we run cross-sectional regressions to estimate a firm's target leverage in each quarter as follows:

$$\begin{aligned} LV_{i,t} = {} & b_0 + b_1 LV_{i,t-1} + b_2 ind\_LV_{i,t-1} + b_3 V_{i,t-1} / A_{i,t-1} + b_4 tangibility_{i,t-1} + b_5 Dividend_{i,t-1} + b_6 OIBD_{i,t-1} / A_{i,t-1} + \\ & b_7 Dp_{i,t-1} / A_{i,t-1} + b_8 RDD_{i,t-1} + b_9 RD_{i,t-1} / A_{i,t-1} + b_{10} \ln(A_{i,t-1}) + b_{11} Infl_{t-1} + b_{12} Dummy_i + b_{13} Dummy_t + e_{i,t} \end{aligned} \tag{3}$$

where *LV* is the leverage level, *V* is the total market value of assets, *A* is the total book value of assets, *tangibility* equals property, plant, and equipment (PPE) divided by total assets, *OIBD* is the operating income before depreciation, *Dp* is the depreciation, *RD* is the R&D expenses, *RDD* is a dummy variable that takes the value of one if R&D expenses is positive, *Infl* is the expected one-year inflation, *e* is the new innovation of leverage, and subscripts $_i$ and $_t$ denote firm *i and* time period *t*, respectively. All variables are obtained or calculated from the Compustat quarterly industry file. Firm and time fixed effects are included in the regression.

Second, we use the estimated coefficients and the quarter *t-1* firm characteristics to calculate the predicted value of the quarter *t* leverage target for every firm. Then, for each firm we subtract the target leverage level from the actual leverage level. We define the absolute value of the difference as the deviation from the optimal leverage level. We next sort the sample into ten portfolios by this deviation measure.[20]

[20] An additional advantage of this approach is that the target leverage is allowed to be time-varying.

Table 8 reports the average monthly returns of portfolios sorted by the leverage deviation. The results are not consistent with the tradeoff story. The return difference between the top and bottom portfolios equals 0.06% per month for equal-weighted portfolios and 0.07% for value-weighted portfolios, and both are statistically insignificant. In addition, there is no apparent pattern across the ten portfolios.

Insert Table 8 about here

A firm may take more than one period to adjust its capital structure to the target level, possibly due to adjustment costs.[21] Therefore, the change in deviation rather than the deviation itself affects stock prices. An increase in the deviation from the target leverage would then lower stock prices and a decrease in the deviation increase stock prices.

To test this prediction, we calculate the quarterly change in the deviation from target leverage for each firm and sort the sample into ten portfolios by the change in the deviation from the target leverage level. Table 8 again shows that the ten portfolios do not exhibit any apparent return patterns. Thus, our main results cannot be explained by the trade-off theory. Our finding that the deviation from the leverage target does not affect stock returns is also consistent with Baker and Wurgler (2002), Strebulaev(2007), and Welch (2004) who show that firms don't actively adjust the capital structure to the target level.

4.4. Market timing hypothesis

The market timing hypothesis predicts that a firm issues new equity when its equity is overvalued and repurchases stock when its equity is undervalued. Baker and Wurgler (2002), among others, argue that the market timing actions have persistent effect on a firm's capital

[21] See Fischer, Heinkel, and Zechner (1989), Flannery and Rangan (2006), Huang and Ritter (2005), and Leary and Roberts (2005a), Liu (2007), Lemmon, Roberts, and Zender (2008), Faulkender, Flannery, Hankins, and Smith (2007), Dudley (2007, 2008), and Cook and Tang, among others.

structure. Studies of exchange offers, in particular SEOs, find leverage increasing transaction result in positive stock price reaction while leverage decreasing transaction result in negative price reaction, likely due to asymmetric information between the firm and the outside investors, among other reasons. (See Eckbo et al. (2007) for a detailed survey of the exchange offer literature.) However, our results are not likely to be driven by firms' market timing actions, such as SEOs and stock repurchases. An SEO decreases leverage but also has a negative announcement return, which is opposite to our finding that leverage decrease leads to higher stock returns. Similarly, a stock repurchase increases leverage but has a positive announcement return, which is again contrary to our findings. Therefore, our results cannot be driven by firms' market timing actions. In this paper we examine the aggregate effect of the change in debt capacity on stock price using a large sample of firms over a long period of time, while studies of security issuance and market timing often focus on a short time period surrounding these specific corporate events. For the most firm-quarter observations included in our study, a firm does not issue new stocks or repurchase existing stocks. As a robustness check, we exclude the months in which a firm announces a SEO or stock repurchase, and the results are similar. Recently, Mahajan and Tartaroglu (2007) find little evidence of market timing in industrialized countries.

4.5. Operational performance hypothesis

Dimitrov and Jain (2003) find an inverse relation between the annual change in leverage caused by operating activities and the next-year stock returns. They argue that managers may have private information that the firm's operating performance will deteriorate in the future. In response, the managers borrow more money to prepare for that. They conjecture that increasing leverage signals poor future operating performance, and results in poor stock return. They also find a negative relation between leverage change and future ROE.

However, ROE may not be an appropriate measure of future operating performance, since net income is mechanically reduced by the interest expenses of the new debt. We thus measure operating performance with ROA and EBITDA. These two variables measure the overall operation of the entire firm, and both are not directly determined by capital structure and are calculated before the interest expenses and tax.

To test the relation between current change in leverage ratio and future operating performance, we regress the average ROA and EBITDA over the next four quarters on the current-quarter change in leverage ratio , ROA, EBITDA, log market value of equity, book-to-market ratio, and one-quarter lagged level of leverage ratio. Table 9 shows that the coefficients of the current leverage change are positive and statistically significant at the 1% level, suggesting that at least in our sample, managers do not increase leverage to prepare for the poor future operating performance.

Insert Table 9 about here

5. Conclusions

Various theoretical models have been developed to explain the determinants of capital structure. Many of these models suggest that change in leverage ratio affects firm value. In this paper, we document that firms with greater increase in leverage ratio during the previous quarter on average have lower abnormal returns. This finding cannot be explained by popular risk factors. Fama-MacBeth (1973) type cross-sectional regressions further verify that the marginal effect of leverage change on stock returns is robust after we control for earnings, investment opportunities, and other firm characteristics.

We show that our results are consistent with a dynamic version of the pecking-order theory, which suggests that an increase in leverage reduces a firm's safe debt capacity and leads to future underinvestment. This theory predicts a negative effect of leverage change on stock prices and a stronger effect for firms with limited debt capacity. We find empirical supports for both predictions. In addition, we find a negative effect of leverage change on future investment. The results are robust after controlling for the effects of changes in growth options and target leverage. These evidences suggest that increasing leverage reduces debt capacity and lead to future underinvestment.

Our results are not subsumed by the potential effects of the default risk. First, there is no evidence that firms with higher leverage increase have consistently higher future returns over the next year. Second, we find that the return patterns documented above also exist among firms that are not in financial distress. The combined evidence suggests that our main result is more likely to be driven by changing expected future cash flows rather than change in the default risk.

Nor can the results be explained with the tradeoff models. Tradeoff models imply an optimal (target) capital structure. Deviation from the target should have a negative effect on stock price. Yet when we sort stocks into portfolios based on the deviation or change in deviation from the target leverage, we do not find significant return patterns across these portfolios. Finally, our results also cannot be explained by the market-timing hypothesis.

To our best knowledge, we are the first to examine the relation between the quarterly changes of leverage and stock price. Our finding of a negative relation between these two variables highlights the importance of debt capacity to the value of a firm.

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Table 1

Summary Statistics

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. At the end of each fiscal quarter, we calculate for each firm the change in leverage. We calculate leverage as the ratio between the book value of total liabilities and the book value of total assets.

Variables	Mean	Median	Standard deviation
Market value of equity ($million)	946	63	7,407
Leverage	0.47	0.48	0.22
Leverage change	0.0045	0.0005	0.0673
Book-to-market ratio	0.79	0.58	0.88

Table 2

Monthly Stock Returns of Portfolios Sorted by Quarterly Leverage Changes

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. At the end of each fiscal quarter we calculate for each firm the change in leverage. We calculate the leverage as the ratio between the book value of total liability and the book value of total assets. We then sort our sample into ten portfolios by leverage change in the current quarter or the most recent quarter. We require each portfolio to have at least 30 stocks. We rebalance the portfolios monthly since in every month there are some firms that end their fiscal quarter. We report both equal- and value-weighted average monthly portfolio returns, as well as the return difference between the top and bottom leverage-change sorted portfolios and the corresponding *t*-statistics (in parentheses).

Leverage change (ΔLV) Portfolios	Portfolios sorted by current quarter leverage change		Portfolios sorted by most recent quarter leverage change		Leverage change (%)	
	Equal-weighted returns(%)	Value-weighted returns (%)	Equal-weighted returns(%)	Value-weighted returns (%)	Mean	Median
1 (lowest ΔLV)	2.83	1.85	2.02	1.42	-10.20	-6.97
2	2.26	1.56	1.93	1.37	-2.91	-2.81
3	1.96	1.37	1.89	1.35	-1.57	-1.54
4	1.74	1.31	1.69	1.24	-0.81	-0.80
5	1.51	1.32	1.64	1.40	-0.22	-0.22
6	1.36	1.07	1.49	1.04	0.36	0.34
7	1.19	0.85	1.39	1.02	1.07	1.04
8	1.07	0.83	1.25	0.87	2.12	2.07
9	0.95	0.60	1.19	1.04	4.06	3.93
10 (highest ΔLV)	0.67	1.19	1.03	0.87	12.54	9.59
Difference (1 – 10)	2.16	0.66	0.99	0.55		
t-statistics	(13.35)***	(3.48)***	(7.28)***	(2.84)***		

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.

Table 3

Risk-adjusted returns of portfolios sorted by leverage changes

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. This table reports the regression intercepts (alphas) and the corresponding *t*-statistics of the leverage-change-sorted portfolio returns in the middle two columns of Table 2. The dependent variables of these regressions are the portfolio returns in excess of the one-month T-bill rate. In the Capital Asset Pricing Model, the independent variable is the market excess returns. In the Fama-French three-factor model, the independent variables include the market excess return, the size factor, and the book-to-market factor. In the four-factor model, the independent variables include the market excess return, the size factor, the book-to-market factor, and the momentum factor. We obtain the factor returns and the one-month T-bill rates from Ken French's website. Panel A reports results for equal-weighted portfolios, and Panel B reports those for value-weighted portfolios. The last column reports the *p*-value for the Gibbons, Ross, and Shanken (1989) test of the null hypothesis that all 10 alphas are equal to zero.

Panel A: Equal-weighted portfolios

		1 (Lowest)	2	3	4	5	6	7	8	9	10 (highest)	*1-10*	GRS test (*p*-value)
CAPM	α (%)	0.70	0.70	0.65	0.47	0.43	0.27	0.15	-0.01	-0.09	-0.31	1.02	
	t-stat	2.78***	3.36***	3.55***	2.77***	2.46**	-1.47	-0.80	-0.03	-0.36	-1.05	7.44***	<.0001***
3-factor	α (%)	0.47	0.38	0.33	0.13	0.11	-0.02	-0.09	-0.22	-0.25	-0.49	0.96	
	t-stat	3.26***	3.10***	3.24***	1.33	1.06	-0.16	-0.76	-1.66*	-1.57	-2.37**	6.86***	<.0001***
4-factor	α (%)	0.56	0.54	0.50	0.32	0.31	0.20	0.18	0.07	0.06	-0.07	0.63	
	t-stat	3.80***	4.52***	5.16***	3.43***	3.38***	1.92*	1.77*	0.58	0.42	-0.37	5.16***	<.0001***

Panel B: value-weighted portfolios

		1 (Lowest)	2	3	4	5	6	7	8	9	10 (Highest)	*1-10*	GRS test (*p*-value)
CAPM	α (%)	0.13	0.17	0.17	-0.28	0.27	-0.09	-0.15	-0.16	-0.36	-0.36	0.49	
	t-stat	0.79	1.55	1.59	1.38	2.93	-1.07	-1.57	-1.11	-2.48**	-2.09**	2.52**	0.0010***
3-factor	α (%)	0.16	0.20	0.22	0.13	0.23	-0.05	-0.10	-0.21	-0.04	-0.34	0.50	
	t-stat	1.13	1.78	2.00**	1.45	2.48**	-0.53	-1.05	-1.89*	-0.30	-2.49**	2.51**	0.0106**
4-factor	α (%)	0.03	0.15	0.19	0.16	0.24	0.03	0.01	-0.17	0.04	-0.41	0.45	
	t-stat	0.23	1.35	1.72*	1.75*	2.60***	0.43	0.08	-1.51	0.26	-2.98***	2.18**	0.0199**

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.

Table 4

Fama-Macbeth (1973) cross-sectional regressions

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. This table reports estimation results for Fama-Macbeth (1973) type cross-sectional regressions. In each month, we run cross-sectional regressions of all available firms. The dependent variable is the stock return in the month. The independent variables include the leverage change and ROE at the most recent fiscal quarter end, the leverage level at the beginning of the most recent quarter, the log market value of equity, beta, and book-to-market ratio at the end of last month, the prior-month return, and the prior-year return. We estimate beta using the last 60-month stock returns. ROE equals net income divided by the book value of equity. We report the average coefficients of all regressions and report their *t*-statistics in parentheses.

Independent variables and Statistics	Dependent variable = monthly stock return (%)			
	(1)	(2)	(3)	(4)
Leverage change	-4.57	-4.70	-3.42	-4.57
	(-8.08)***	(-7.76)***	(-7.64)***	(-9.12)***
Leverage level		0.20	0.05	0.06
		(0.65)	(0.20)	(0.25)
Beta			0.06	
			(0.20)	
Change in beta				17.46
				(1.25)
Log(market value of equity)			-0.14	
			(-2.65)***	
Change in log market value of equity				-0.26
				(-1.10)
Book-to-market			0.92	
			(12.85)***	
Change in book-to-market				2.63
				(10.18)***
ROE			1.12	
			(4.58)***	
Change in ROE				0.30
				(4.36)***
Prior one-year return			0.49	0.26
			(4.16)***	(1.87)*
Prior one-month return			-6.55	-4.39
			(-15.02)***	(-8.57)***
N	336	336	336	336

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.

Table 5

Future investment regression

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. This table reports the average coefficients and their *t*-statistics in the Fama-Macbeth (1973) type cross-sectional regressions. In each quarter during 1975-2001, we run cross-sectional regressions of all available firms. The dependent variables include the future changes in Q, the investment rate, and the R&D and capital expenditure. We calculate the future changes of these variables as the average value of the next four quarters minus the current value. Q equals the market value of total assets divided by the book value of total assets, where the market value of total assets equals the market value of equity and the book value of total liabilities. The investment rate equals the change in total assets from last quarter normalized by the total assets of last quarter. The R&D and capital expenditure equals the sum of the R&D and expenditure expenses divided by the total assets of the last quarter. The main independent variable in models (1), (3) and (5) is the change in leverage ratio. To control for the effects of growth option and change in target leverage on the change in actual leverage, we estimate a regression of the actual leverage change with the contemporaneous changes in book-to-market ratio and target leverage as well as the previous-period book-to-market ratioas the independent variables. We then use the residual from this regression as the main independent variable in models (2), (4), and (6). Other independent variables include the log market value of equity, the book-to-market ratio, ROE, and target leverage. Target leverage is estimated as the predicted value of following regression specification.

$$LV_{i,t} = b_0 + b_1 LV_{i,t-1} + b_2 ind\_LV_{i,t-1} + b_3 V_{i,t-1} / A_{i,t-1} + b_4 tangibility_{i,t-1} + b_5 Dividend_{i,t-1} + b_6 OIBD_{i,t-1} / A_{i,t-1} + b_7 Dp_{i,t-1} / A_{i,t-1} + b_8 RDD_{i,t-1} + b_9 RD_{i,t-1} / A_{i,t-1} + b_{10} \ln(A_{i,t-1}) + b_{11} Infl_{t-1} + b_{12} Dummy_i + b_{13} Dummy_t + e_{i,t}$$

where LV is the leverage level, V is the total market value of assets, A is the total book value of assets, tangibility equals property, plant, and equipment (PPE) divided by total assets, OIBD is the operating income before depreciation, Dp is the depreciation, RD is the R&D expenses, RDD is a dummy variable that takes the value of one if R&D expenses is positive, Infl is the expected one-year inflation, e is the new innovation of leverage, and subscripts $_i$ and $_t$ denote firm *i and* time period *t*, respectively. All variables are obtained or calculated from the Compustat quarterly industry file. Firm and time fixed effects are included in the regression. We report the average coefficients of all regressions and present their *t*-statistics in parentheses.

Independent variable and statistics	*Q*		*Investment rate*		*R&D and capital expenditure*	
	(1)	(2)	(3)	(4)	(5)	(6)
Leverage change	-1.044 (-7.80)***		-0.623 (-6.10)***		-0.076 (-6.29)***	
Residual of leverage change		-1.03 (-7.70)***		-0.642 (-6.34)***		-0.083 (-6.68)***
Book-to-market	0.158 (10.19)***	0.159 (10.26)***	-0.006 (-1.37)	-0.005 (-1.14)	0.001 (2.49)**	0.001 (2.69)***
Log (Market value of equity)	-0.034 (-9.07)***	-0.034 (-9.09)***	-0.003 (-1.75)*	-0.003 (-1.76)*	-0.001 (-2.56)**	-0.001 (-3.04)
ROE	0.086 (1.90)*	0.087 (1.91)*	-0.030 (-7.41)***	-0.030 (-7.48)***	0.001 (1.27)	0.001 (0.90)
Leverage target		0.028 (0.21)		-0.031 (-0.75)		-0.074 (-8.40)***
N	108	108	108	108	75	75

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.

Table 6

Monthly returns of portfolios sorted by debt capacity and leverage change

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. We measure debt capacity with total book assets, leverage level, Ohlsen's (1980) *O*-score, *VX* measure (Vassalou and Xing (2004)), and Whited and Wu (2006) FC index. We first sort the sample into five portfolios by leverage level, total assets, *O*-score, *VX* measures, or FC index at the beginning of the most recent fiscal quarter. We then sort each of the five portfolios into five sub-portfolios by leverage change during the most recent quarter. We require each portfolio to have at least 30 stocks. We rebalance the portfolios monthly, since in every month there are some firms that end their fiscal quarter. We report both the equal- and value-weighted average monthly portfolio returns. For each debt capacity quintile, we also report the return difference between and top and bottom leverage-change sorted portfolios, and its corresponding *t*-statistic (in parentheses).

Panel A: Mean returns (%) of portfolios sorted by leverage level and leverage change

	Leverage Level Portfolio (equal-weighted)					Leverage Level Portfolio (value-weighted)				
Leverage Change Portfolio	1 (lowest)	2	3	4	5 (highest)	1 (lowest)	2	3	4	5 (highest)
1 (lowest)	1.38	1.74	1.99	2.25	2.45	0.75	1.56	1.48	1.41	1.85
2	1.37	1.72	1.69	2.00	2.25	1.00	1.40	1.35	1.47	1.86
3	1.57	1.61	1.66	1.54	1.65	1.23	1.20	1.24	1.22	1.44
4	1.44	1.61	1.42	1.23	1.00	0.91	1.08	1.02	1.09	0.92
5 (highest)	1.37	1.17	1.04	0.88	0.77	0.98	1.01	1.04	0.99	1.11
Difference (1 – 5)	0.19	0.57	0.94	1.37	1.68	-0.23	0.54	0.44	0.42	0.74
(t-statistics)	(0.10)	(3.31)***	(6.53)***	(8.15)***	(9.24)***	(-0.70)	(1.87)*	(1.70)*	(1.76)*	(2.82)***

Panel B: Mean returns (%) of portfolios sorted by total asset and leverage change

	Total Asset Portfolio (equal-weighted)					Total Asset Portfolio (value-weighted)				
Leverage Change Portfolio	1 (Smallest)	2	3	4	5 (Largest)	1 (Smallest)	2	3	4	5 (Largest)
1 (lowest)	2.41	1.92	1.82	1.85	1.63	1.14	1.16	1.39	1.40	1.39
2	2.38	1.96	1.78	1.70	1.52	1.29	1.47	1.38	1.28	1.32
3	2.17	1.55	1.46	1.53	1.40	1.41	1.07	1.26	1.37	1.20
4	1.72	1.48	1.32	1.09	1.09	0.91	1.25	1.12	1.32	0.99
5 (highest)	1.47	0.97	0.76	0.83	0.97	0.44	0.86	1.01	0.92	0.99
Difference (1 – 5)	0.94	0.94	1.05	1.01	0.66	0.70	0.30	0.38	0.48	0.39
(t-statistics)	(4.86)***	(5.92)***	(6.98)***	(6.85)***	(5.85)***	(2.28)**	(1.32)	(2.00)**	(2.80)***	(2.73)***

Panel C: Mean returns (%) of portfolios sorted by O-score and leverage change

Leverage Change Portfolio	*O*-score Portfolio (equal-weighted) 1 (Smallest)	2	3	4	5 (Largest)	*O*-score Portfolio (value-weighted) 1 (Smallest)	2	3	4	5 (Largest)
1 (lowest)	1.51	1.86	1.84	2.21	2.43	1.16	1.50	1.61	1.63	1.55
2	1.48	1.70	1.82	1.92	2.05	1.29	1.33	1.49	1.51	1.35
3	1.55	1.53	1.72	1.50	1.48	1.18	1.24	1.39	1.36	0.43
4	1.67	1.41	1.34	1.23	1.04	1.09	1.05	0.78	0.81	0.05
5 (highest)	1.63	1.33	1.24	0.64	0.67	1.01	1.09	0.83	0.70	0.18
Difference (1 – 5)	-0.12	0.53	0.60	1.58	1.75	0.15	0.41	0.78	0.93	1.37
(t-statistics)	(-0.97)	(4.42)***	(4.77)***	(8.58)***	(8.40)***	(0.64)	(1.90)*	(3.74)***	(3.10)**	(3.88)***

Panel D: Mean returns (%) of portfolios sorted by VX default likelihood and leverage change

Leverage Change Portfolio	*VX* Portfolio (equal-weighted) 1 (Smallest)	2	3	4	5 (Largest)	*VX* Portfolio (value-weighted) 1 (Smallest)	2	3	4	5 (Largest)
1 (lowest)	1.56	1.78	1.94	1.84	2.76	1.50	2.00	1.59	1.72	2.23
2	1.56	1.25	1.76	1.98	2.25	1.43	1.46	1.32	1.60	1.94
3	1.50	1.21	1.31	1.27	1.33	1.43	1.49	1.54	1.40	1.25
4	1.36	1.23	1.63	1.11	0.89	1.05	1.07	1.10	1.08	0.20
5 (highest)	1.25	1.42	1.71	0.75	0.29	1.19	1.07	1.29	0.73	0.08
Difference (1 – 5)	0.31	0.36	0.23	1.09	2.47	0.31	0.92	0.31	1.00	2.15
(t-statistics)	(1.05)	(0.28)	(0.11)	(4.93)***	(8.08)***	(1.65)	(3.26)***	(1.05)	(3.02)***	(5.30)***

Panel E: Mean returns (%) of portfolios sorted by FC index and leverage change

Leverage Change Portfolio	FC Index Portfolio (equal-weighted) 1 (Smallest)	2	3	4	5 (Largest)	FC Index Portfolio (value-weighted) 1 (Smallest)	2	3	4	5 (Largest)
1 (lowest)	1.59	1.69	1.93	1.96	1.94	1.35	1.31	1.54	1.07	1.33
2	1.44	1.71	1.69	1.86	1.84	1.21	1.39	1.42	1.09	1.33
3	1.31	1.44	1.47	1.56	1.46	1.20	1.25	0.82	1.08	0.76
4	1.11	1.30	1.21	1.32	0.99	0.92	1.25	0.96	0.64	0.17
5 (highest)	1.10	1.12	1.24	0.91	0.72	1.13	0.89	0.92	0.39	0.85
Difference (1 – 5)	0.50	0.57	0.69	1.05	1.22	0.21	0.42	0.62	0.68	0.39
(t-statistics)	(4.82)***	(4.56)***	(5.29)***	(6.47)***	(5.67)***	(1.38)	(2.25)**	(2.66)**	(2.42)**	(1.11)

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.

Table 7

Cumulative next-year returns of portfolios sorted by leverage changes

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. At the end of each fiscal quarter, we calculate for each firm the change in leverage. We calculate leverage as the ratio between the book value of total liability and the book value of total assets. In Panel A, we sort our sample into ten portfolios by the leverage change in the most recent fiscal quarter. We require each portfolio to have at least 30 stocks. We rebalance the portfolios monthly, since in every month there are some firms that end their fiscal quarter. We then calculate the cumulative portfolio returns over the one-year period starting one quarter after forming the portfolios. Thus the one-year return in this table has no overlap with the stock returns in the previous tables. In Panel B, we first sort the sample into five portfolios by leverage level at the beginning of last quarter. We then sort each of the five portfolios into five sub-portfolios by leverage change of the last quarter. We then calculate the cumulative portfolio returns over the one-year period starting one quarter after forming the portfolios. We report both the equal- and value-weighted average monthly portfolio returns, and the return difference between and top and bottom leverage-change sorted portfolios as well as the corresponding *t*-statistics (in parentheses).

Panel A: Cumulative next-year returns of portfolios sorted by leverage changes

	1 (lowest)	2	3	4	5	6	7	8	9	10 (highest)	*10-1*	T-stat (10-1)
Equal-weighted	17.93	20.42	19.74	19.07	18.03	18.00	17.56	17.77	17.74	18.56	-0.63	(-1.09)
Value-weighted	13.62	15.07	14.74	14.22	14.30	14.20	13.53	15.05	14.03	12.82	0.80	(1.00)

Panel B: Cumulative next-year returns of portfolios sorted by leverage level and leverage change

Leverage Change Portfolio	Equal-weighted portfolio returns					Value-weighted portfolio returns				
	Leverage Portfolio					Leverage Portfolio				
	1 (lowest)	2	3	4	5 (highest)	1 (lowest)	2	3	4	5 (highest)
1 (lowest)	17.98	17.09	18.69	20.24	20.32	13.42	16.37	13.42	14.69	16.86
2	16.87	17.87	18.83	19.21	21.97	13.59	14.00	13.78	15.02	17.91
3	17.25	18.25	17.89	17.46	19.36	11.45	15.32	13.38	14.13	16.28
4	16.40	17.78	16.46	16.46	18.48	10.70	14.79	12.99	14.91	15.71
5 (highest)	17.63	16.95	17.78	18.53	20.09	12.82	12.24	13.54	16.16	17.38
1-5	0.35	0.14	0.90	1.72	0.22	0.59	4.12	-0.12	-1.47	-0.52
t-stat(1-5)	(0.46)	(0.25)	(1.31)	(2.46)***	(0.34)	(0.41)	(3.24)***	(-0.11)	(-1.60)	(-0.47)

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.

Table 8

Monthly returns of portfolios sorted by deviation from leverage target

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. To calculate the leverage deviation, we first estimate a cross-sectional regression of leverage of the following form

$$LV_{i,t} = b_0 + b_1 LV_{i,t-1} + b_2 ind\_LV_{i,t-1} + b_3 V_{i,t-1} / A_{i,t-1} + b_4 tangibility_{i,t-1} + b_5 Dividend_{i,t-1} + b_6 OIBD_{i,t-1} / A_{i,t-1} + b_7 Dp_{i,t-1} / A_{i,t-1} + b_8 RDD_{i,t-1} + b_9 RD_{i,t-1} / A_{i,t-1} + b_{10} \ln(A_{i,t-1}) + b_{11} Infl_{t-1} + b_{12} Dummy_i + b_{13} Dummy_t + e_{i,t}$$

where LV is the leverage level, V is the total market value of assets, A is the total book value of assets, tangibility equals property, plant, and equipment (PPE) divided by total assets, OIBD is the operating income before depreciation, Dp is the depreciation, RD is the R&D expenses, RDD is a dummy variable that takes the value of one if R&D expenses is positive, Infl is the expected one-year inflation, e is the new innovation of leverage, and subscripts i and t denote firm *i and* time period *t*, respectively. All variables are obtained or calculated from the Compustat quarterly industry file. Firm and time fixed effects are included in the regression. We then use the coefficients and the last-quarter information to calculate the predicted value of the current-quarter target leverage for every firm. The deviation from the target leverage equals the absolute difference between the actual leverage and the target leverage. We then sort our sample into ten portfolios by the leverage deviation. To address the possible slow adjustment to leverage deviation, we further calculate the change in leverage deviation from the last quarter and sort the sample into ten portfolios according to the changes in leverage deviation. We require each portfolio to have at least 30 stocks. We rebalance the portfolios monthly, since in every month there are some firms that end their fiscal quarter. We report both equal- and value-weighted average monthly portfolio returns, as well as the return difference between the top and bottom leverage-change sorted portfolios and the corresponding *t*-statistics (in parentheses).

	Leverage deviation portfolios		Change in leverage deviation portfolios	
Portfolio ranking	Equal-weighted returns (%)	Value-weighted returns (%)	Equal-weighted returns (%)	Value-weighted returns (%)
1 (lowest ΔLV)	1.34	1.10	1.32	1.01
2	1.31	0.97	1.40	0.89
3	1.41	1.01	1.34	1.07
4	1.38	1.09	1.38	1.16
5	1.26	0.96	1.37	1.06
6	1.39	1.18	1.27	1.11
7	1.31	1.06	1.32	0.83
8	1.33	1.03	1.39	1.22
9	1.24	1.01	1.34	1.08
10 (highest ΔLV)	1.28	1.02	1.27	1.06
Difference (1 – 10)	0.06	0.07	0.05	-0.05
t-statistics	(0.32)	(0.31)	(0.48)	(-0.24)

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.

Table 9

Future operating performance regressions

The sample consists of all nonfinancial and nonutility firms that have a positive book value of equity, non-negative book value of total liabilities, and are available from both the CRSP monthly file and Compustat quarterly file during 1975-2002. This table reports the average coefficients and their *t*-statistics in the Fama-Macbeth (1973) type cross-sectional regressions. We run cross-sectional regressions for each quarter during 1975-2001. The dependent variables include the average ROA and EBITDA of the next four fiscal quarters. We calculate ROA as the ratio between earnings before interests and tax (EBIT) and the beginning-period total assets. We calculate EBITDA as the sum of EBIT and depreciation and amortization divided the beginning-period total assets. The independent variables include the leverage change, ROA, EBITDA, the log market value of equity, the book-to-market ratio of current fiscal quarter, and the leverage level of last quarter. We report the average coefficients of all regressions, and present their t-statistics in parentheses.

Independent variable and statistics	*Dependent variable = Future ROA*		*Dependent variable = Future EBITDA*	
	(1)	(2)	(3)	(4)
Leverage change	0.019	0.021	0.015	0.018
	(5.56)***	(6.12)***	(4.55)***	(5.25)***
Current ROA	0.518	0.483		
	(39.02)***	(37.43)***		
Current EBITDA			0.519	0.484
			(38.84)***	(37.37)***
Leverage level		0.008		0.008
		(4.95)***		(5.53)***
Log(size)		0.002		0.002
		(15.48)***		(17.28)***
Book-to-market		-0.001		-0.001
		(-2.58)***		(-3.52)***
N	108	108	108	108

***, **, and * denote statistical significance at %1%, 5%, 10% levels, respectively.